

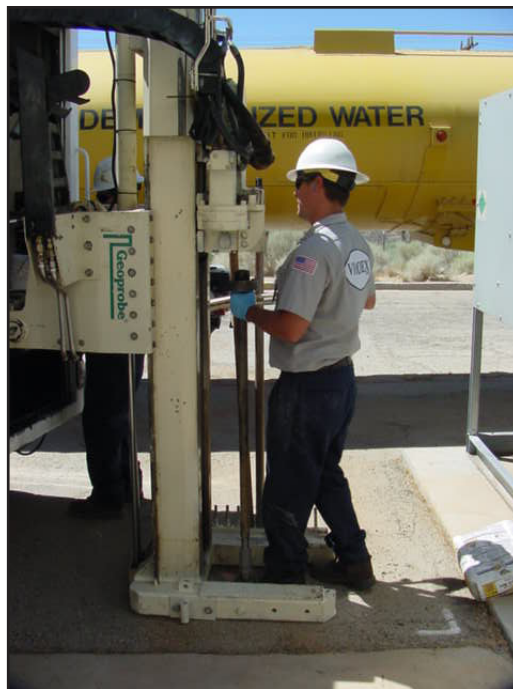
ERP Fact Sheet

February 2012



This Fact Sheet addresses further vapor assessment activities at the Air Force Research Laboratory, Detachment 7, Edwards Air Force Base.

Additional Vapor Assessments Will Be Conducted at Air Force Research Lab



(Left) A Vironex contractor prepares the drill rig that will create the borehole of a vapor well. (Right) An Environmental Support Technologies driller labels a temporary vapor well located adjacent to an occupied building. These activities were part of an investigation into the vapor intrusion pathway for occupied buildings at South AFRL. Similar investigations will occur in other parts of AFRL, Det 7.

Ensuring a safe work environment for employees is top priority at Edwards Air Force Base. Environmental Management officials will continue vapor assessments throughout the Air Force Research Laboratory, Detachment 7 (AFRL, Det 7) to identify locations where chemical vapors could pose a long-term exposure hazard to base employees.

Environmental experts plan to take a combination of outdoor soil vapor samples and indoor air samples in occupied buildings to check for the presence of chemical vapors. The samples measure the vapor concentrations of chemicals (if present) to assess whether any preventative measures need to be taken to protect human

health.

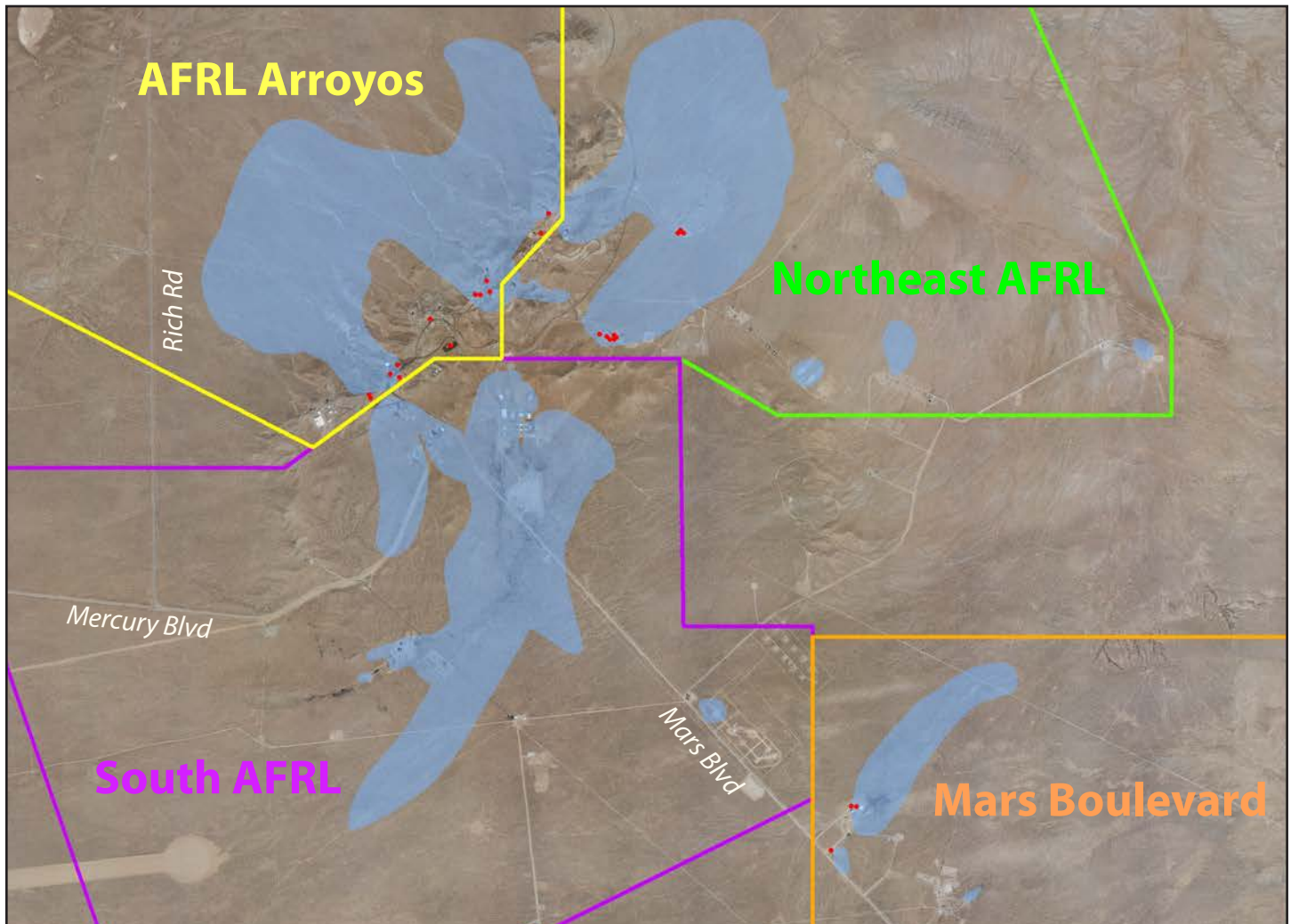
Vapor Pathway

The primary groundwater contaminants at AFRL, Det 7, have chemical properties that could cause them to volatilize — vaporize or evaporate, like rubbing alcohol — and enter the surrounding air. These contaminants are known as volatile organic compounds or VOCs for short. Because of their chemical properties, VOCs can vaporize out of the groundwater and enter into the gaseous phase of the underlying soil. The chemicals in the soil gas can then move both vertically and horizontally through the soil.

Building entry of VOCs occurs when

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The AFRL, Det 7, is divided into four areas: AFRL Arroyos, Northeast AFRL, Mars Boulevard and South AFRL. Facilities in the South AFRL area were assessed from 2008-2009. Environmental experts plan to continue vapor assessments in occupied buildings within the other three areas at AFRL, Det 7. The red dots indicate the 26 buildings proposed for assessment.

The following buildings will be checked for possible vapor pathways:

8370	8620	8826
8472	8626	8900
8473	8635	8902
8474	8663	8903
8475	8753	8909
8477	8761	9628
8483	8762	9631
8582	8765	9634
8585	8812	

chemical vapors from groundwater and subsurface soil leak through cracks and holes in a building's structure. In this way, people working in buildings above plumes of contaminated groundwater could potentially be exposed to VOCs.

AFRL, Det 7, Contaminants

The most common VOCs found at AFRL, Det 7, are tetrachloroethene (PCE) and trichloroethene (TCE). These chlorinated solvents were used for years to clean dirt and grease from equipment and metal parts.

The effects of long-term air exposure to low-level concentrations of PCE and

TCE are unknown. For employees who work routinely with these chemicals, the Occupational Safety and Health Administration has set an exposure limit for each VOC at 100 parts per million (ppm) averaged over an 8-hour workday. The 100 ppm measurement is equivalent to 678,240 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) for PCE and 537,420 $\mu\text{g}/\text{m}^3$ for TCE. The contaminants differ in molecular weight (MW); MW is used to convert ppm to $\mu\text{g}/\text{m}^3$.

The Air Force is also assessing vapor concentrations of other VOCs, such as the breakdown products of PCE and TCE, vinyl chloride, benzene and chloroform.

These contaminants are present in much lower concentrations than PCE and TCE in the groundwater at AFRL, Det 7.

Very Low Levels Found

So far, the highest vapor concentration found in the indoor air of a building at AFRL, Det 7, has been $4.7 \mu\text{g}/\text{m}^3$ of PCE. This reading was measured in Building 8595, a location where historic evidence identified a chemical spill and regular cleaning of rocket parts with PCE and TCE. Some of the indoor air samples were taken under worst case conditions, with the building ventilation and nearby soil vapor extraction systems not in operation. One such 22-hour test in Building 8595 revealed a spot in the building that measured $4.7 \mu\text{g}/\text{m}^3$ of PCE, the highest concentration measured throughout AFRL, Det 7.

According to state and federal regulators, chemical vapors migrating from the subsurface into indoor work areas should pose no more than a one-in-a-million health risk to employees. This equates to one person in one million developing cancer if exposed to chemical vapors continuously for 25 years. Continuous exposure is defined as 8 hours per day, 250 days a year, over a 25-year period.

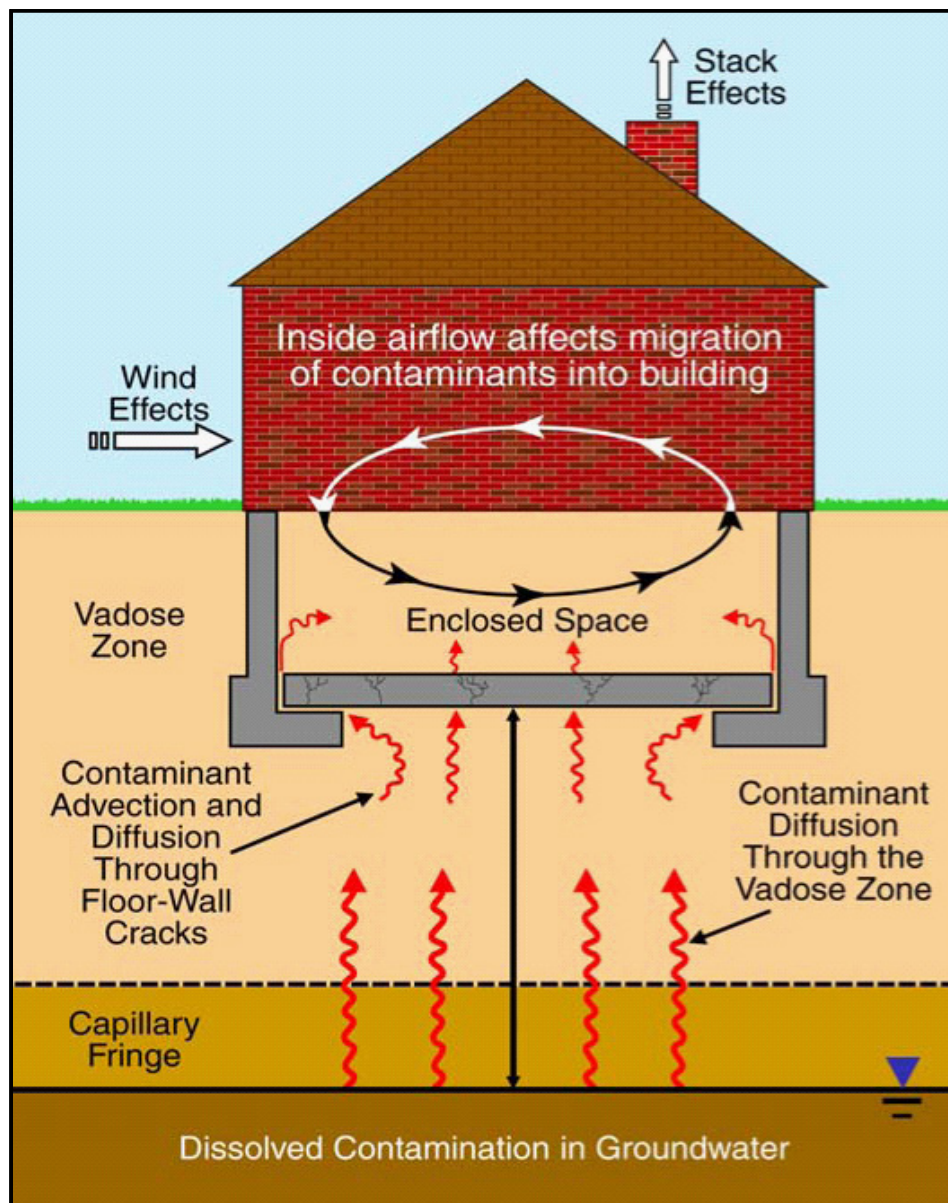
This conservative risk level is designed to be very protective of human health. An employee's risk level is based on an assumed continuous exposure.

Currently, the $4.7 \mu\text{g}/\text{m}^3$ equals a cancer risk level exceeding one chance in one million, based on 25 years of continuous exposure.

Preventative Actions

Several steps have been taken at Building 8595 to prevent exposure to indoor PCE vapor concentrations exceeding the established exposure level. The Air Force monitors indoor air levels and installed four wells in the building to measure vapor concentrations under floor slabs. Additionally, a soil vapor extraction system near the building actively reduces the vapor concentration under the building.

The ventilation system was also evaluated to see if modifications could increase the exchange rate of air within



Conceptual site model illustrating vapor intrusion from groundwater contamination. The vadose zone includes all earth material above the groundwater and is seldom saturated. The capillary fringe is an area of variable thickness where water is drawn up by capillary action. Graphic courtesy of the Interstate Technology & Regulatory Council.

the building. A high air exchange rate means better circulation of outside air into the building, which lowers vapor concentrations.

Other occupied buildings will receive the same protective treatment if indoor air exceeds risk levels. Engineering controls such as vapor barriers and ventilation design will be a prerequisite for new structures built within vapor

boundary areas. Vapor boundary areas are tracked in the base's Geographic Information System (GIS). Before new construction is approved, the project must pass the Environmental Impact Analysis Process, which uses GIS to check for any restrictions in the proposed area of construction.

The Way Forward

The Building 8595 vapor assessment

was part of a series of assessments conducted in facilities that sat above groundwater contaminant plumes in South AFRL. Air Force officials are now focusing on facilities in proximity to groundwater plumes in the Arroyos, Northeast and Mars Boulevard AFRL areas.

Environmental experts will first look for evidence of vapors present outside an occupied building. Soil vapor samples to screen for the presence of VOCs that could potentially migrate into indoor air will be collected in the vicinity of buildings overlying groundwater plumes containing VOC contaminants. Analysts have defined areas, called vapor boundaries, where AFRL, Det 7, groundwater contains VOCs at concentrations that potentially pose a risk to indoor air for industrial use. None

of the groundwater inside the AFRL, Det 7, is used for drinking water.

Depending on outside vapor detection, sampling under floor slabs will need to be performed to get an accurate assessment of whether VOCs are present as vapor beneath the building. Sampling under floor slabs involves drilling small-diameter boreholes through the building's floor. This procedure, combined with indoor air sampling, provides the quickest method of accurately assessing if vapors are present.

As previously mentioned, the Air Force will take appropriate action to protect human health and the environment. Officials will brief the commander and associated personnel if any further actions need to be taken after vapor assessment results have been analyzed.

More Information Available

The Air Force encourages the public to gain a more complete understanding of AFRL, Det 7, and the cleanup activities that were conducted there. All documents that the base used to make decisions about cleanup at AFRL, Det 7, are in the base's administrative record. To view the full record, contact Mr. Gary Hatch at:

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To view a subset of decision documents, you may also visit one of the other Information Repository locations listed below.

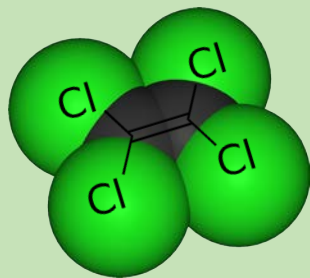
Information Repositories:

Edwards AFB Library
5 W. Yeager Blvd.
Edwards AFB, Calif.
(661) 275-2665

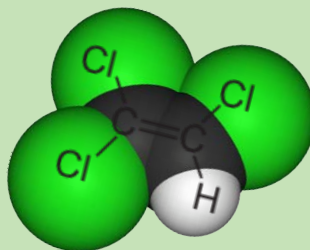
Kern County Public Library
Wanda Kirk Branch
3611 Rosamond Blvd.
Rosamond, Calif.
(661) 256-3236

Los Angeles County Public Library
601 W. Lancaster Blvd.
Lancaster, Calif.
(661) 948-5029

Health Effects of Tetrachloroethene (PCE) and Trichloroethene (TCE)



The chemical PCE is commonly found in dry cleaning products. In addition to being a potential carcinogen, high concentrations of PCE can cause dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness and death. Alias: PCE is also known as tetrachloroethylene.



Breathed in small amounts, TCE may cause headaches, lung irritation, dizziness, poor coordination and difficulty concentrating. In large amounts, TCE may cause impaired heart function, unconsciousness and death. Breathing it for long periods may cause nerve, kidney and liver damage. It is also a potential carcinogen. Aliases: TCE is also known as trichloroethylene and ethylene trichloride.

For more information, visit the Agency for Toxic Substances & Disease Registry website at www.atsdr.cdc.gov.

